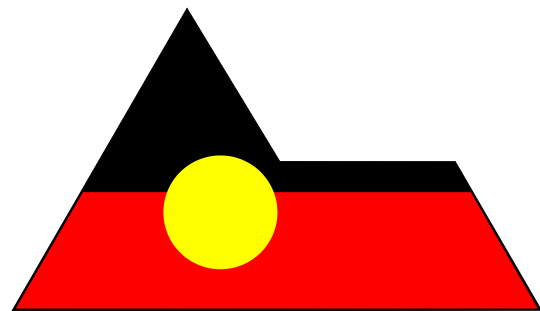


eTask Package

Leader's Support 1 Day Workshop



Mathematics Task Centre

Workshop Objectives

That staff, parents and students involved in the day achieve a 'kick start' to an exciting new aspect of the school's mathematics curriculum by:

- Creating a starter set of hands-on problem solving tasks
- Exploring tasks and the support provided through Mathematics Centre
- Planning for introduction, on-going task creation and continuing professional development

We hope you have an enjoyable and professionally stimulating day.

Preparation

Important: Read the eTask Maker Manual first. It only takes 10 minutes at the most.

The workshop assumes previous staff discussion has led to agreement about, and some enthusiasm for, creating (or extending) a Task Library from eTasks. Addressing the questions below in advance of the workshop will aid preparation. Answers to some will be informed by reading appropriate sections of the Teachers' Handbook: <http://mathematicscentre.com/taskcentre/docs.htm#taskcentre>. From its index choose links such as:

- What Is A Task Centre?
- Task Centre or Tasks In Classrooms?
- Why Use Tasks?
- Labelling Tasks

Questions

- Have you discussed using Maths With Attitude eManuals to integrate the use of tasks and Maths300 into a Working Mathematically core curriculum?
- Have you decided how you will use tasks ...dedicated Task Centre room? ...housed in teachers' rooms? ...moved around the school?
- Have you decided how tasks will be packaged and stored? ...press-seal bags? ...boxes?
- Have you organised printing/laminating the eTasks and ancillary material chosen for the workshop? Your choices will depend on your situation, but possibly all the Easy ones.
Note: You will need one Task 35, Crosses, printed and laminated for the workshop and multiple copies of its equipment as listed below in At The Venue.
- Have you arranged with the school administration for teacher release?
- Have you decided whether key parents and/or students will be invited to join the workshop and, if so, issued invitations?
- Have you distributed the eTask Maker Manual to all participants with a request to pre-read pages 1 - 4? ...about 5 minutes work.
- Have you gathered the basic equipment, extra equipment which may have been decided in advance and 'bits' described in the Maker Manual on pages 2 and 4?
- Have you organised the room, seating arrangements (participants will work in pairs, so tables of four works well), data projector, screen, whiteboard and Internet connectivity? ...participants will need to connect on a 1 between 2 basis.
- Have you printed the documents below?
- Have you arranged catering for the day?

Printing

Find these files at ... <http://mathematicscentre.com/taskcentre/docs.htm#curriculum>

- Welcome & Working Mathematically (2 pages back to back - *workmath.pdf*)
- Learning Features (1 page - *features.pdf*)
- If you wish, back Learning Features with either Working With Mathematics Centre (*mathcent.pdf*) or Creating Working Mathematically Curriculum (*wmplancmc.pdf*).

Electronic Resources

Slide show: *etaskslides.pdf*

- Note: This is a PDF slide show not a PowerPoint. It is supplied with the eTask Package.
- Double click to open. Confirm full screen request if asked.
- Esc key undoes full screen. Also Ctrl L toggles between full screen and regular screen.
- Use arrow keys to move through the slides.

Cube Tube Video(s)

- Check your laptop is able to play video from Cube Tube
... <http://mathematicscentre.com/mathematicscentre/cubetube.htm>

At The Venue

- Layout the prepared cards in a way that looks attractive and accessible.
- Place the card for Task 35, *Crosses*, where you can find it easily.
- In another place lay out the equipment collection.
- In a third place lay out the bags or boxes you are using to store the tasks and the stickers for labelling tasks if you have chosen to do that.
- Connect to the sound system of the room and test.
- Place 9 square tiles and a permanent marking pen where each pair will sit. For each pair the tiles should all be the same colour, but the colour can be different from group to group.
- The printing above is handed out as needed rather than cluttering tables at the beginning.
- Display Slide 1 and have a browser open in the background.

Please Help Us Improve

These workshop notes have developed from the experiences of teachers running similar workshops over many years. They are always open to improvement and we welcome any suggestions for doing so. We also welcome comments, photographs and the like which might help us retell the eTask story to others.

External Professional Development

If you prefer, Mathematics Centre may be able to arrange an experienced consultant to present this workshop for you. We can also arrange professional development around introducing, establishing and embedding eTasks within a core curriculum focusing on learning to work like a mathematician. Please contact us to discuss these options if you wish.

Presentation

*As you prepare this workshop please have the slide show open and view slides when they are mentioned. Double click **etaskslides.pdf** to start the show.*

SESSION 1 (2 hours)

As the workshop proceeds you may want to make to build a record of the day by making a list of the sub-headings as they are covered.

- **Introduction**

- **Slide 1:** Title
- Welcome as appropriate.
- **Slides 2 & 3:** 100% PD and stories of success
- *As the day proceeds we will discover that Mathematics Centre is a professional development web site designed to collect and retell stories of success from classrooms.*
- **Slide 4:** Learning to work like a mathematician
- *The stories are chosen to illustrate the concept of all students learning to work like a mathematician...*
- **Slide 5:** Learning to WLAM and Teaching Craft
- *...and the teaching craft likely to capture and involve students.*
- *What do you see as the work of a mathematician?*
- Discuss briefly and make notes on the whiteboard as appropriate.
- *Now let's check these hypotheses with mathematicians. Here is what four Australian mathematicians say about their work...*
- **Slides 6 - 9:** Masel / Chen / Wong / Tao
- *How do these statements match with our hypotheses?*
- Alter the board list as appropriate.
- *Over time Mathematics Centre has asked several mathematicians to describe their work and all the responses come down to this...*
- **Slide 10:** First give me an interesting problem...
- *This is exactly what tasks are designed to do - encourage learners to choose their own interesting problems.*
- **Slide 11:** Our objective
- *Tasks include several features designed to interest students in the problem. One of these is hands-on materials. So let's start there.*

- **The First Task**

- Ask each pair to write the digits 1 to 9 on their 9 tiles as large as possible in their 'best handwriting'. Explain that each set will be used in student tasks so the quality of the work is important.
- *Now arrange your tiles in the shape of a plus sign...*
- *If you have happened upon the right way to do that, the sum of the digits vertically will be the same as the sum of the digits horizontally.*
- This can be done, so now each pair has a problem. Encourage partners to look for a solution. When one is found ask for it to be recorded on the board and for the finders to claim it with their initials.
- *Great work. But there is another solution. Let's see who can find that.*
- Record the next solution in the same way.
- *So finding two solutions begs the question ... Are there more?*
- Spend 5 minutes searching for and recording more solutions.
- *Today is not so much about doing maths as it is about making maths for the students to do, so we are not going to push this problem further.*

- Show the *Crosses* task card, collect a set of digits from one pair and package the task.
- *Now we have made our first task.*
- Demonstrate the labelling system you have previously decided on (see Questions above) and where you want the completed tasks placed.
- **Tip of an Iceberg**
 - *Before we declare this task 'ready' there are a couple of things it can teach us about every task. For example, at this stage a mathematician might ask the deeper question: How many solutions are there?, closely followed by the even deeper one: How will we know when we have found them all?.*
 - Take a moment to ask if anyone has sensed anything in the data which might help to answer the first question. Perhaps it will be noted, for example, that none of the solutions has an even number in the centre. That leads to further questions or perhaps to the suggestion that if the centre number was turned face down it might be easier to find a solution.
(Remember, this is a brief experience designed to indicate where the initial challenge could lead. It is not necessary to actually go that way now.)
 - *A mathematician might also ask: What happens if the plus sign is a different size?.*
 - *If we were making a smaller plus sign, what digits would we use?*
 - Briefly look for at least one solution using the digits 1 - 5.
 - *So there is at least one solution for 1 - 5 and our experience already encourages us to look for more. If we were going to start with the next biggest plus sign after 1 - 9, what digits would we use?*
 - Tiles 1 - 13 will be suggested...
...and which digits for the one after that ... and after that ... and ... So there is a pattern, which is...?
 - Suggest that the next problem for a mathematician might be to predict the number of solutions for crosses of any size.
 - **Slide 12: Tip of an iceberg**
 - *So our new task as it appears on the card represents the tip of an iceberg. How deeply two learners explore it at a particular time will depend on several things including their age and experience and the guiding questions asked by their roving teacher. However, we should note that if the students keep a diary or journal of their investigations (as a mathematician must if they are working over months or years as Terry Tao suggests) then they will be able to return to the investigation in the future and continue it.*
 - This is exactly the same as a student putting a bookmark in a book and returning later to continue the literary adventure.
- **Task Cameos**
 - **Slide 13: Mathematics Centre URL**
 - *Mathematics Centre provides teachers with information about the depth of each task, and more, through its Task Cameo Library.*
 - Ask teachers to open their browser (to encourage conversation one device between two is recommended) and go to *mathematicscentre.com*.
 - *You might like to bookmark this page.*
 - Task Cameos are found through the link on this home page.
 - When you arrive at the Task Cameo page, point out that all the front page links appear again in the link box at the top of this and any other similar page. Also note that the Search Mathematics Centre link in that box goes to the home page where there are search facilities.
 - *You will find Crosses in the Library list on the right side of the Task Cameo page. You can scroll down (or use Ctrl F) to find it.*
 - *Open the link, read it through and discuss the information with your partner to get a sense of the support available for each of the 241 tasks.*

- When teachers have had a few minutes to read, summarise with these points:
 - Cameos are designed to help teachers help their students dig deeper into the problem. In the process the answers, or clear steps for obtaining them, are revealed.
 - Any task can be used as a whole class investigation but more equipment will have to be obtained or improvised. *Crosses* is an example of improvisation.
 - The purpose of a whole class investigation is to model what how to work like a mathematician.
 - Using a whole class investigation is similar to a language teacher choosing a book to read with the whole class in order to dig more deeply into it as a literature study. Some of the students might have read it but their experience is used to enrich the adventure.
 - If a task has a Maths300 companion lesson it is listed in the whole class investigation section of its cameo. Also in the Cameo library one star (*) beside a task name indicates a companion Maths300 lesson and two stars (**) indicates this lesson also has software.
 - Maths300 lessons provide extensive teaching notes which support teachers to choose best practice teaching methods to build a whole class investigation that models how to work like a mathematician.
 - If the task has a From The Classroom Section it is because teachers have taken the time to provide it. That invitation is open to everyone.
 - Highlight that in *Crosses* case the Buloba Primary School contribution shows a simplified version of the task being successfully used in a very different classroom situation. Also the contribution from Ulla shows the task is definitely the work of a mathematician. Encourage participants to notice that the $4N + 1$ in the formula relates to their own recognition of 'plus sign numbers' being 5, 9, 13,...
- **Slide 14:** Three lives
- *In summary, a task is an invitation to two students to work like a mathematician.*
 1. *The task card reveals the tip of the iceberg.*
 2. *Task Cameos help teachers help students learn more about that iceberg.*
 3. *The deeper investigation can be explored by the pair themselves, or within a whole class lesson or with the help of an Investigation Guide which teachers prepare based on the Task Cameo.*
- On the Task Cameo page show the list of tasks for which teachers have written and shared Investigation Guides.
- **Slide 15:** Juggling curriculum time
- *A Working Mathematically core curriculum will begin with problems and*
...juggle time learners spend working on tasks with
...time they are involved in whole class investigations and
...time they spend practising the skills of a mathematician.
To do that we need more tasks, so let's get making.
- **Making More Tasks**
 - Display all the eTask cards from these lists which are in the set you prepared for the day.
 - *Tasks with 1 - 9 tiles:*
 Truth Tiles 1 (#30), Number Tiles (#43), Fay's Nines (#54), Steps (#176),
 Division Boxes (#210 - needs zero), Take Away Tiles (#215 - needs zero),
 Less Than Fractions (#240)
 - *Tasks using other sets of digit tiles:*
 Truth Tiles 2 (#17), Fraction Magic Square (#37), Magic Squares (#92),
 Square Pairs (#216)
 - Share the work of creating each of these tasks, that is, matching the card with its equipment, labelling and placing on the 'finished table'. If all of these eTask cards were prepared in advance, in about 5 minutes the team will have added 11 tasks to the set.

- Invite partners to begin an intensive period of creating more and more tasks.

Experience suggests that about an hour remains in the first session of the day at this point.

- Interrupt this session when the You Need section of a card lists a Recording Sheet. Show these on site (<http://mathematicscentre.com/taskcentre/docs.htm#recording>) and ask that the 'makers' copy 20 to include with the task.
 - *What will be our system for keeping this stock updated. Who will take responsibility?*

SESSION 2 (1.5 - 2 hours)

Teachers have found it is important to introduce tasks to students in the context of learning to work like a mathematician. This helps them to be seen as part of the intellectual challenges making up the curriculum, rather than as diversions to try to bring some fun into the curriculum. This doesn't mean they aren't fun. It means that the features which make them fun are designed to involve learners in the intellectual struggle.

• Introducing Tasks to a Class

- **Slide 16:** Cover of 'A Mathematician's Lament'
- *Now that we have a starter set of tasks, we'll suspend making for a while and think about starting to use them in class. The author of this book is a maths teacher who has also been a research mathematician. Here are some extracts.*
- **Slides 17, 18:** Paul Lockhart extracts
- Ask participants to read through the selections.
- *Do you see any links between what Paul is describing and what we want to achieve by including tasks in our curriculum?*
- *Do you see any links between what Paul is describing and the objectives of the Australian Curriculum: Mathematics? (or your local external curriculum document)*
- Discuss and lead again towards the context of learning to work like a mathematician.
- *The eTasks package suggests a way of introducing tasks which sets them in this context from the start. Apparently it has been successful for many teachers and I am going to model it now. You'll be my class and I will have arranged some form of mathematics journal for each learner.*

○ Modelling the introduction of tasks

Modelling like this with a group of teachers will always be a little 'unreal'. Certainly act out as below, but keep it light and in the context of retelling a story which has been successful for other teachers.

The Beginning

- It is suggested that before the class starts, or as the students are entering, you lay the tasks out attractively and write on the board 'School mathematics is learning to work like a mathematician'. (20 tasks is plenty for a class.)
- *What do you think mathematicians do?*
- Indicate that with a class this is discussed briefly to work towards the concept of 'do problems' (*As we did in the previous session.*), so that the words 'First give me an interesting problem' can be written on the board.

Getting to this point should be about 3 minutes.

- Introduce the selection of tasks and invite *one pair* to choose a task to help you illustrate.
- Gather everyone at this pair's table.

- *So these two have one of the school's tasks on their table. What would be the first thing to do now.* Usually the response is 'open the bag' so you follow with *...and do what with it then.* If no one suggests counting the pieces, then introduce this as your expectation *...because in choosing this task we are accepting responsibility for returning it as we found it so it's right for the next person.*
- Respond to further suggestions in a way that develops the process of:
Count ... the equipment and count it back again at the end of the lesson.
Read ... through the whole card first to sense where it is going.
Try ... what's on the card.
- Ask a volunteer to write those three words down the board as here.
- Ask around the room for participants to repeat the steps.
We want students to automatically do this, so we plan to remind them for a while.
- In an organised way, invite other pairs to select tasks and to **CRT**.
- *I ask just two things:*
(a) *that you stick with the task you have chosen as the one for today.*
(b) *that as well as asking for assistance, if you need it, from your partner, another student or myself, that you ask me to come if you reach the bottom of the card.*

The reason for (b) is to briefly review what the learners have tried and recorded (see next point) and to phrase a question which helps them see that the task could be explored further. Invite them to continue it 'right now' if they wish.

The Middle

- Keep an eye out for a pair doing something which offers an opportunity to introduce the importance and use of journals. Pause the class and highlight what that group is doing and the value of recording the particular thing.
- Ask only that the learners record the title of the problem and the date - *like a diary* - and suggest that whatever they record they should do it so *they* would understand the notes if they came back to the task *...three weeks from now.*
- Add **Record** and **Ask** (reminding them about b above) to **CRT** to make **CRTRA**.
- Allow time for participants to work on the task they have chosen. During this time hand out the Working Mathematically page with a comment along the lines of:
As we have seen, mathematicians report that their work begins with an interesting problem. When pressed to tell us more, this was their response. As you work try to identify which parts of this you have already used and consider which other parts could lead you further into the problem.

In a 50 minute student class, the getting started time for this introductory lesson would be about 5 minutes, the work time about 30 minutes and the ending about 10 minutes as below. In this workshop situation make adjustments to that as necessary, but keep in mind that pairs will be asked to keep their task and journal notes to be used later, so they will need enough time to develop a reasonable sense of the problem.

The End

Finalise your modelling by suggesting that each task lesson is ended by:

- Allowing learners 5 minutes to journalise, in particular to record the next question to ask when they return to this task.
 - Allowing 5 minutes to count pieces back in and (perhaps) for one group to do a 'sell' on the task they used. (Choose the pair during the lesson and invite them to do this.)
- Ask the workshop group to keep their task and journal notes for use in the next session.

- **Reviewing the Introductory Lesson**

- Remind participants that this was a modelling exercise based on what has been done in real classrooms. Briefly review and unpack it by asking participants to retell the key elements and why they see them as important. Include elements such as:
 - Setting the context
 - Using a demonstration group
 - Beginning with a problem
 - Class selecting their tasks in an organised way
 - Simplicity of the management procedure of CRTRA
 - Introduction of the Working Mathematically page (which could become a room display)
 - Encouragement to dig deeper into the task - now or later
 - Use of a journal
 - Distinct and purposeful end of the lesson
 - Lesson end suggests continuation rather than completion
- **Slide 19: Features**
- Hand out the Features sheet explaining that this list has been made up from teacher insights in many workshops. Ask participants to identify the teaching craft features involved in the day so far.

To this point about 1 hour of the second session will have elapsed.
Use the remaining time in this session to make more tasks.

SESSION 3 (1 - 1.5 hours)

- **Learning from Mathematics Centre**

- **Slide 20: Repeat of WLAM / Teaching craft**
- *We have discovered that each task is the tip of an iceberg but that is also true of the Mathematics Centre site. We have learnt a little about the support it offers, but now we are going to dig deeper. We will start by exploring the outcomes of the Introductory Lesson as reported by one school.*
- **More on Journals**
 - Ask teachers to return to the Mathematics Centre home page. Take the Mathematics Task Centre link from there, then Recording & Publishing. Do it on screen as participants follow on their device.
 - Scroll down to find the article 'Recording at Ashburton Primary School'.
(This is also appropriate if the workshop is for secondary teachers.)
 - Invite teachers to read through this article.
 - Click any image to produce a higher resolution version.
 - Note that each task mentioned is linked to its Task Cameo.
 - Ask that in particular teachers find out what Truth Tiles 2 is about.
 - Allow time to read through and when you judge most are near the end, arrange for everyone to watch the Cube Tube video of Blair & Alexander's work on the projector.
(No point having the same video running out of sequence from different devices around the room.)
 - *Now that we have seen what is possible for learners to do, what questions does it raise for us about journals?* Discuss, make decisions and assign actions as necessary.

- **Learning from each other**
 - Pair the pairs to make groups of 4 which 'show and tell' to each other the task they were exploring during the Introductory Lesson. Allow 5 minutes per pair.
 - *How can we continue the process of sharing knowledge and experience about tasks?* Discuss, make decisions and assign actions as necessary.
- **Research Groups**
 - The Ashburton article indicates there is more to discover in Mathematics Centre. Organise research groups and choose or assign any of the questions below to be investigated.
 - There may be time to begin research now, but there won't be time to finish it. Discuss and plan an approach for sharing findings ... one page printed summaries? ... making use of the school intranet? ... email communication? ... presentations at future staff meetings? ...
 - Choose from the questions below (or any others that have arisen through the day).
 1. *What materials do we need in order to make more tasks and how do we organise to obtain them?*
 2. *Tasks are an invitation to work like a mathematician. Whole class lessons are used to model how to work like a mathematician. What more can we learn about teaching whole class investigations?*
 3. *How can tasks be integrated into unit plans?*
 4. *How can student learning be assessed and reported when using tasks?*
 5. *What can we learn from other classroom stories on site?*
 6. *What research evidence is there for the educational value of using tasks within Working Mathematically curriculum?*
 7. *Journal writing is keeping notes as you work. What part will be played in the curriculum by publishing based on the notes? What forms could the publishing take?*
 8. *As we develop this curriculum what place is there for resources such as Maths With Attitude, Menu Maths, Picture Puzzles, Calculating Changes (primary), Maths300.*
 - Demonstrate how the home page search engine could be one starting point for research. For example, search 'unit plan'. Another starting point could be the Task Centre Teachers' Handbook. Demonstrate how this can be found from the Documents link on the Mathematics Task Centre page and show its index.
- **Plenary**
 - **Slide 21:** Repeat of Our Objective
 - Hand out a blank A4 page to each person and ask them to draw a large oval.
 - *Add features to make a face which shows how you feel about this day.*
 - *Add a thought bubble recording what you think has been most important to you in the day.*
 - Collect and display later in the staff room.
 - Collect email addresses from those who want to receive eNews and pass them on later to Mathematics Centre.
 - Run a round table session based on the questions:
 1. What has to be done now?
 2. Who is going to do it?
 3. By when does it have to be done?
 - Choose a time, place and purpose for the next meeting of the whole group and close with appropriate thanks.